

**423-41-56**

# **Interface Control Document Between EOSDIS Core System (ECS) and the Data Assimilation System (DAS)**

**September 1997**



National Aeronautics and  
Space Administration

Goddard Space Flight Center  
Greenbelt, Maryland

Interface Control Document Between the Earth Observing System  
Data and Information System (EOSDIS) Core System (ECS) and  
the Data Assimilation System (DAS) for the ECS Project

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## Preface

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This document is a formal contract deliverable with an approval code 1. It requires Government review and approval prior to acceptance and use. This document is under ECS contractor configuration control. Once this document is approved, Contractor approved changes are handled in accordance with Class I and Class II change control requirements described in the EOS Configuration Management Plan, and changes to this document shall be made by document change notice (DCN) or by complete revision.

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## Abstract

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This Interface Control Document (ICD) defines the functional and physical design of system interfaces between the Earth Observing System Data and Information System (EOSDIS) Core System (ECS) and the Data Assimilation System (DAS).

This ICD also presents the interface definition for the system interfaces between ECS Release B and the DAS. These interfaces include the system interface between ECS and the DASCE (Data Assimilation System Computing Environment), and ECS and the Data Reduction Platform (DRP) located at the Goddard Space and Flight Center (GSFC) Distributed Active Archive Center (DAAC). ECS releases after B.0 may include DRPs at other DAAC locations as required.

It is important to note that this ICD does not explicitly define ECS user interfaces. User interfaces are addressed within this ICD for informational purposes only. The interface between the GSFC DAAC and the DASCE is not defined in this ICD.

This ICD is consistent with the Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System (ECS Level 3 requirements) and the Interface Requirement Document (IRD) Between ECS and the DAS.

**Keywords:** DAAC, DAO, DASCE, DRP, ECS, ftp, interface ICD, ODL, PVL

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## **Appendix A. ECS Data Type Identifier for DAS Products**

## **Appendix B. Work-off Plan for ECS-DAS ICD**

## **Abbreviations and Acronyms**

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# 1. Introduction

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## 1.1 Identification

This Interface Control Document (ICD), Contract Data Requirement List (CDRL) item 029, whose requirements are specified in Data Item Description (DID) 209/SE1, is a required deliverable under the Earth Observing System (EOS) Data and Information System (EOSDIS) Core System (ECS), Contract (NAS5-60000).

## 1.2 Scope

The ECS-DAS ICD provides definition for the system interfaces between ECS Release B and the DAS system. This ICD does not explicitly define ECS user interfaces. User interfaces with ECS to acquire DAS product data are described herein for informational purposes only.

The Earth Science Data and Information System (ESDIS) Project has responsibility for the development and maintenance of this ICD with support from the Data Assimilation Office (DAO). Any changes in the interface definition must be agreed to by the relevant participating parties, and then assessed at the ESDIS Project Level. This ICD is approved under the signatures of the ESDIS Project Managers and the Head of the DAO.

ECS Release B provides support to ESDIS Science Operations and ESDIS Ground Systems Certification Testing. Release B provides the functional capabilities needed to provide support to EOS AM-1 Mission Operations and Science Operations, and Landsat 7 and SAGE III missions. Release B also provides archive and distribution services for the DAS. Table 1-1 provides a mapping of ECS functionality to DAS interfaces for the newly defined Releases B.0 and B.1. Releases C & D provide evolutionary enhancements to the ECS services provided in the earlier Releases.

For the ECS Release B to DAS interface, this ICD provides definition of control messages supporting data exchange, definition of the data exchange protocol for transferring data files from DAS to ECS, and the DAS-ECS physical communications connection. This ICD also presents the definition of the full ECS Release B-DAS system interfaces which support transfer, ingest, archive and distribution of DAS product data and metadata.

This document reflects the technical baseline, maintained by the ECS Configuration Control Board in accordance with the ECS technical direction (see Section 2.2).



<b>ECS Functions</b>	<b>ECS Release</b>
<b>Ingest</b>	
polling ingest with PDR	B.0
<b>CSS/IDG</b>	
soft authentication	B.0
ftp	B.0
<b>Science Data Server</b>	
subscription (user)	B.1
product order	B.0
order status	B.1
product order cancellation	B.1
distribution notice	B.1
SDSRV performance reporting	B.1

***Table 1-1. Mapping of ECS Functionality to DAS by Releases B.0 and B.1***

### **1.3 Purpose**

This document is written to formalize the interpretation and general understanding of the interfaces between ECS and the DAS. These interfaces exist in order to allow transfer of DAS product data, associated metadata, and information to ECS for data archive and for distribution of DAS products to users directly from ECS. This document provides clarification and elaboration of the ECS-DAS interfaces to the extent necessary to assure hardware, software, and operational service compatibility within the end-to-end system.

This document provides a point of mutual control of system interface definitions for the ESDIS and DAO Project Configuration Control Boards (CCBs).

### **1.4 Status and Schedule**

This ICD between the ECS and the DAS will be implemented in ECS Release B. This ICD is submitted as an ECS Project CCB approval code document. In general, within this document are some interfaces that have associated To Be Determined (TBD), To Be Resolved (TBR), and/or To Be Supplied (TBS) items. A Work-Off Plan is provided in Appendix B for resolving open items. This plan provides the following information:

- a. ICD I/F Issue Number
- b. ICD Reference Paragraph
- c. ICD Issue Priority
- d. ICD Issue Type - Description

- e. Work-off Plan Task(s)
- f. Projected Resolution Date
- g. Risk Assessment

In its final form, at the Government's option, this document may be designated to be under full Government CCB control. Changes may be submitted at any time for consideration by Contractor and Government CCBs under the normal change process.

## **1.5 Organization**

This document is organized in 5 sections plus appendices.

Section 1 provides information regarding the identification, scope, purpose and objectives, and organization of this document.

Section 2 contains information about documentation relevant to this ICD, including parent, applicable, and information documents.

Section 3 provides an overview of the ECS-DAS interfaces, with a brief description of the interfaces involved.

Section 4 provides an overview of the data exchange framework.

Section 5 contains a description of ECS-DAS data flows, including data format and content, the data transfer method(s), and error handling.

Appendix A provides the ECS Data Type Identifiers for DAS Products.

Appendix B provides the Work-Off Plan supporting resolution of issues and closures of TBD, TBR and/or TBS items.

A list of abbreviations and acronyms is also provided.

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## 2. Related Documentation

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### 2.1 Parent Documents

The following documents are the parents from which this document's scope and content are derived.

193-208-SE1-001	Methodology for Definition of External Interfaces for the ECS Project
423-41-54	Interface Requirements Document Between Earth Observing System Data and information System (EOSDIS) Core System (ECS) and the Data Assimilation System (DAS) for the ECS Project
none	Memorandum of Understanding Between the Data Assimilation Office and ESDIS Project. dated June 26, 1996
423-10-01-0	Goddard Space Flight Center, Earth Science Data and Information System (ESDIS) Level 2 Requirements EOSDIS Core System (ECS)
423-41-01	Goddard Space Flight Center, EOSDIS Core System Statement of Work
423-41-02	Goddard Space Flight Center, Functional and Performance Requirements Specification for the EOSDIS Core System
505-10-20	System Interface Control Plan for the ESDIS Project
301-CD-002-003	System Implementation Plan for the ECS Project

### 2.2 Applicable Documents

The following documents (or in some cases, Internet links to documents/information), are referenced herein and are directly applicable to this document to the extent of the reference. In the event of conflict between any of these documents and this document, this document shall take precedence. Internet links cannot be guaranteed for accuracy or currency.

224-CD-001-001	Release B Release Plan for the ECS Project
305-CD-021-002	Release B SDPS Client Subsystem Design Specification for the ECS Project
305-CD-024-002	Release B SDPS Data Server Subsystem Design Specification for the ECS Project
305-CD-025-002	Release B SDPS Ingest Subsystem Design Specification for the ECS Project

305-CD-028-002	Release B CSMS Communication Subsystem Design Specification for the ECS Project
305-CD-029-002	Release B CSMS System Management Subsystem Design Specification for the ECS Project
305-CD-033-002	Release B EDC DAAC Design Specification for the ECS Project
305-CD-038-002	Release B System Management Center (SMC) Design Specification for the ECS Project
311-CD-002-004	Science Data Processing Segment (SDPS) Database Design and Database Schema Specifications for the ECS Project
311-CD-003-005	Communications and System Management Segment (CSMS) Database Design and Database Schema Specifications for the ECS Project
210-TP-001-006	Technical Baseline for the ECS Project
none	Data Assimilation Office, File Specification for GEOS-3 Gridded Output
505-41-32	ICD Between ECS and the Landsat 7 System
none	Goddard Space Flight Center, ECS Technical Direction No. 11, "PDR Technical Baseline
RFC 791	Internet Protocol, J. Postel (WWW access: <a href="gopher://ds.internic.net:70/">gopher://ds.internic.net:70/</a> )
RFC 793	Transmission Control Protocol, J. Postel (WWW access: <a href="gopher://ds.internic.net:70/">gopher://ds.internic.net:70/</a> )
RFC 959	File Transfer Protocol, Internet Standards, J. Postel, J. Reynolds (WWW access: <a href="gopher://ds.internic.net:70/">gopher://ds.internic.net:70/</a> )

## 2.3 Information Documents

The following documents (or in some cases, Internet links to documents/information), although not directly applicable, amplify or clarify the information presented in this document, but are not binding. Internet links cannot be guaranteed for accuracy or currency.

194-201-SE1-001	Systems Engineering Plan for the ECS Project
194-202-SE1-001	Standards and Procedures for the ECS Project
205-CD-001-002	Science User's Guide and Operations Procedure Handbook for the ECS Project, Parts 1-3

505-41-33	Goddard Space Flight Center, Interface Control Document between EOSDIS Core System (ECS) and Science Computing Facilities (SCF)
193-208-SE1-001	Methodology for Definition of External Interfaces for the ECS Project
604-CD-001-004	Operations Concept for the ECS Project: Part 1-- ECS Overview
604-CD-002-003	Operations Concept for the ECS project: Part 2B -- ECS Release B
175-WP-001-001	HDF-EOS Primer for Version 1 EOSDIS (White Paper for the ECS Project)
CCSDS 641.0-B-1	Consultative Committee for Space Data Systems (CCSDS), Recommendation for Space Data System Standards: PVLSPEC - Parameter Value Language Specification, 5/92 (WWW access to CCSDS Documents Library: <a href="http://ddwilson.gsfc.nasa.gov/CCSDS-A.html">http://ddwilson.gsfc.nasa.gov/CCSDS-A.html</a> (request a keyword search on "PVL"))
CCSDS 641.0-G-1	Consultative Committee for Space Data Systems (CCSDS), Report Concerning Space Data System Standards, Parameter Value Language - A Tutorial, Green Book (WWW access to CCSDS Documents Library: <a href="http://ddwilson.gsfc.nasa.gov/CCSDS-A.html">http://ddwilson.gsfc.nasa.gov/CCSDS-A.html</a> (request a keyword search on "PVL"))
604-CD-001-004	Operations Concept for the ECS Project: Part 1-- Overview
604-CD-002-003	Operations Concept for the ECS Project: Part 2B -- Release B

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### 3. Interface Overview

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The DAS and ECS work together to provide DAS Product data and metadata for science community research. The DASCE (Data Assimilation System Computing Environment) produces research-quality assimilated data products and then provides those products to ECS for ingest, archive and distribution. All ECS registered users are permitted access to DAS standard product data and metadata archived by ECS.

ECS support for the archive and distribution of DAS product data is located at the GSFC DAAC. ECS at the GSFC DAAC provides: ingest of and long-term storage for DAS standard product data; EOSDIS user access to DAS data and a catalog of archived DAS data for data search and product order; science data subsetting and distribution of products in response to orders. In ECS Release B.1, distribution of archived data to the DASCE DRP will be handled via a machine to machine interface **TBD**.

Figure 3-1 provides a top-level view of the ECS-DAS interfaces. These interfaces show system interfaces supporting required data flows for acquisition and distribution of DAS product data. These products are made available to ECS via a “Polling with Delivery Record” data transfer mechanism which is described in further detail in Section 4. The ECS Science Data Processing Segment (SDPS) provides a set of ingest, processing, and distribution and archive services for the EOSDIS. The ECS-DAS data exchange and user data access are supported by communication/networking services through ECS, and the DAO provided network connection (see Section 4.1.1).

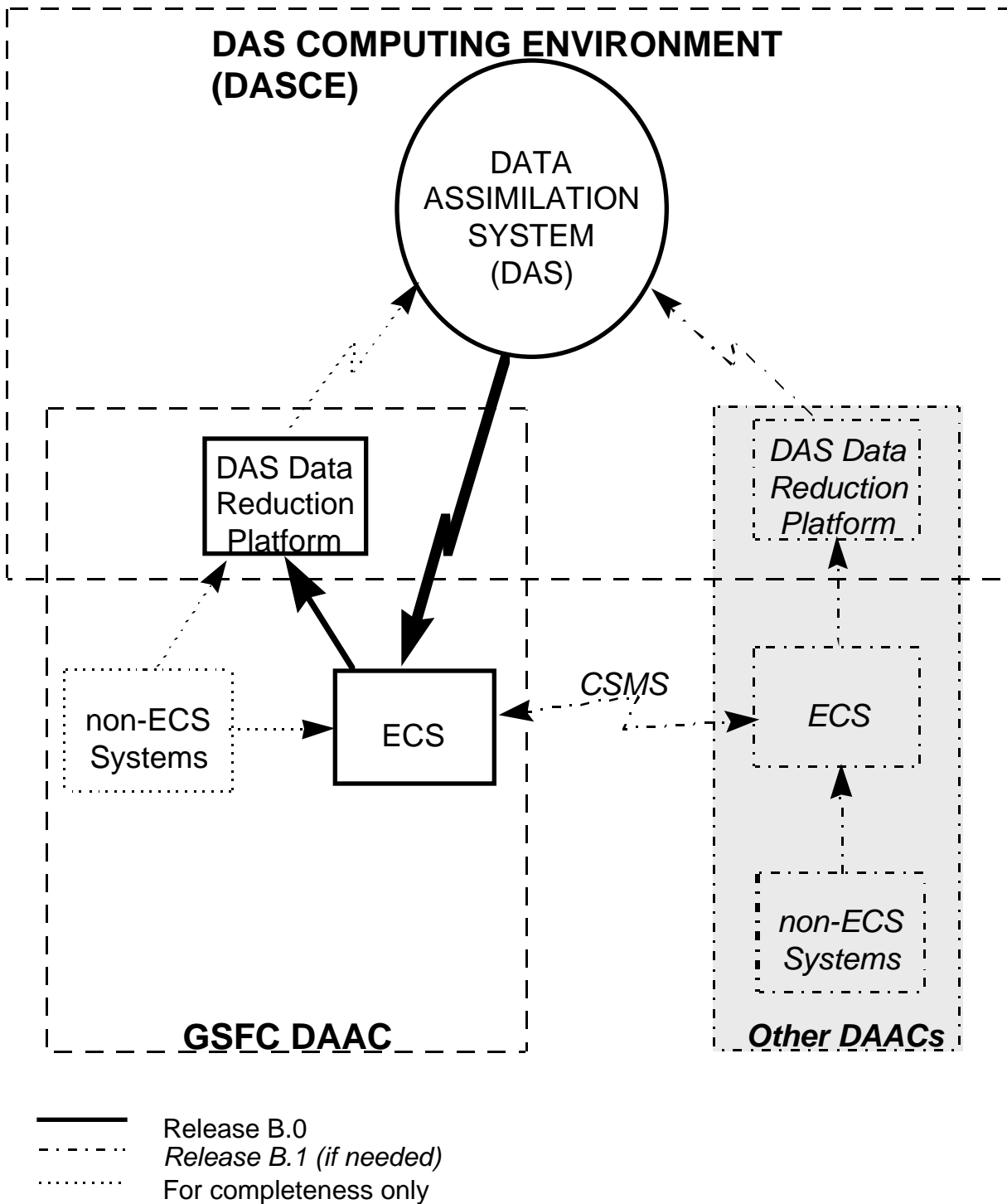
#### 3.1 ECS-DAS System Interfaces

System interfaces between the DAS and ECS provide the means for transferring DAS data and for sending messages supporting data transfer.

Table 3-1 provides a list of the ECS-DAS system interface data flows, identifying source and destination for each flow. These interfaces are fully supported by ECS Release B.

The interfaces listed in Table 3-1 are described within this ICD to support ECS and DAS design and test activities. Interface operations are described within the ECS Operations Concept Documents listed in Section 2.3.





**Figure 3-1. Network Interfaces Between ECS and the DASCE**

**Table 3-1. ECS-DAS System External Interfaces**

Item Number	Source	Destination	Message	Data	Transfer Mechanism
1	DAS	ECS	Product Delivery Record	N/A	FTP (get)
2	ECS	DAS	*Product Delivery Record Discrepancy (PDRD) (Short/Long)	N/A	FTP (push)
3	DAS	ECS	N/A	DAS Product Data and Metadata	FTP (get)
4	ECS	DAS	N/A	**Machine-to-Machine transfer <b>TBD</b> of archived data to the DASCE	FTP (push)
5	ECS	DAS	Product Acceptance Notification (PAN) (Short/Long)	N/A	FTP (push)

\* This FTP message is used only in the event of an error in the Product Delivery Record

\*\* Release B.1 functionality to be used during Reanalysis

## 3.2 DAS User Interfaces

ECS Release B.1 will be capable of distributing up to 70GB of DAS data products during a single day. All ECS registered users are permitted access to DAS standard product data archived by ECS. Personnel located at the DASCE will interface with the ECS as registered ECS users to acquire their requisite archived products through normal user operational interfaces. Appendix A provides a description of the DAS data products available for order.

User interfaces require human interaction with ECS for data query and selection. Users may query the archived data by specific search criteria, view metadata representing the query results, and order products for distribution electronically or on physical media. Prior to placing an order, users may request and receive a price estimate for the requested products. After placing an order, users may contact ECS by phone, e-mail, or normal user operational interfaces for product order status.

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## 4. Data Exchange Framework

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This section describes the data exchange framework supporting the ECS and DAS system interfaces presented in Section 3.1. The descriptions include network topologies, internetworking protocols, electronic data exchange, data exchange control messages, physical media data exchange, data exchange formats and data exchange security. Specific characteristics of each ECS and DAS data flow supported by the framework are provided in Section 5.

### 4.1 Internetworking Protocols (OSI Model Layers)

The ECS and DAS communications are supported by internetworking services that are consistent with the Open Systems Interconnection (OSI) reference model, as defined in the International Organization for Standardization, Basic Reference Model of Systems Interconnection (ISO 7498). These services are also described in "Internet Programming; Jamsa Press, Nevada, 1995".

#### 4.1.1 Physical/Datalink (Link Layer)

The interface from NASA Ames to the GSFC DAAC is via an Asynchronous Transfer Mode (ATM) line through NASA's National Research and Education Network (NREN). The DAO ATM line enters Building 1 at GSFC. The network connection goes through the GSFC firewall and across the GSFC CNE net to Building 32. From this point, the network will enter ECS through GSFC DAAC connections.

#### 4.1.2 Internet Protocol (Network Layer)

The network layer provides the functional and procedural means to exchange network data units (i.e., packets) between devices over network connections, both for connection-mode and connectionless-mode communications. It relieves the transport layer of any concern regarding routing and relay operations associated with network connection. The basic function of the network layer is to provide the transparent transfer of data between devices. It should be noted that the network layer delivers packets only to a device, not an individual process---it remains up to the transport layer protocol to include, beforehand, the additional information needed to permit addressing to an individual process. Network layer protocols supported by ECS networks include Internet Protocol (IP) plus various routing protocols.

The Internet Protocol (IP), specified in RFC 791, supports network layer data exchanges between the ECS and the DASCE. The network layer provides the transparent transfer of data between transport entities. The IP addresses for the network nodes and data hosts are determined by the time of installation at the GSFC DAAC and will be documented in the GSFC DAAC-DAO Operations Letter.

As part of IP support, Internet Control Message Protocol (ICMP) and Address Resolution Protocol (ARP) are also supported. As the Internet Engineering Task Force (IETF)-specified new generation IP becomes available for deployment, it will be supported by ECS networks.

ECS generally uses Routing Information Protocol (RIP) for route exchanges with external networks. Other more robust routing protocols such as Border Gateway Protocol (BGP-4) can also be used depending on the need and center routing policies.

### **4.1.3 Transport Protocol (Transport Layer)**

Connection-oriented transport service is implemented using Transport Control Protocol (TCP). TCP, specified in RFC 793, is a connection-oriented, end-to-end reliable protocol designed to fit into a layered hierarchy of protocols which support multi-network applications. It provides for guaranteed delivery of data between pairs of processors in host computers attached to networks within and outside ECS.

### **4.1.4 Application Protocols (Application Layer)**

The application-level protocols for data transfer between ECS and the DAS host computers are accomplished through the use of the File Transfer Protocol (FTP). The FTP protocol, described in RFC 959, is an internet standard.

### **4.1.5 File Transfer Protocol (ftp)**

File transfers between ECS and the DASCE are accomplished through the use of standard File Transfer Protocol (ftp). FTP, as described in RFC 959, is an internet standard for file transfers that support downloading of files, by a user (acting as a client), from a remote server.

## **4.2 Data Exchange Between DAS and ECS**

Data exchange between the DAS and ECS consists of Data/Metadata files and reports being sent from the DAS to ECS. The data transfer mechanism specifics from ECS to the DASCE DRP for ECS Release B.1 are **TBD**. Data transfer is accomplished through the use of ECS Polling Ingest with Product Delivery Record process, as defined in the Release B SDPS Ingest Subsystem (INS) Design Specification for the ECS Project. The ECS Polling with Delivery Record process is based upon the heritage of the Landsat-7 Image Assessment System (L7 IAS) interface design, as described in the ICD Between the ECS and Landsat 7 System (505-41-32).

### **4.2.1 Polling Ingest With Product Delivery Record**

The purpose of the ECS/DASCE electronic interface is to support the delivery of the Data/Metadata Files (DMF) from the DAS to ECS. A Polling Ingest with Product Delivery Record mechanism is employed for the purpose of transferring the DMF to ECS. To accommodate this interface, a single PDR server has been identified; the DMF and the Product Delivery Records (PDRs) will be placed on this server by the DAS. The PDR Server is a DAO owned Unix workstation located at the NASA Ames facility. At the end of this data exchange, the DAS is responsible for cleaning the PDR Server disk of the PDR and DMFs. This implementation of the Polling Ingest with PDR consists of the following steps (see Figure 4-1):

- (1) The DAS places the DMF on the PDR Server in a specified location -
- (2) The DAS generates a PDR; places the PDR on the PDR Server in a known directory -
- (3) With operator tunable periodicity, ECS polls the directory on the PDR Server, and detects/retrieves the PDR -

The ECS side of the interface is equipped with an ftp daemon---a computer program which automatically, and with operator-tunable periodicity, polls the PDR Server, detects a PDR file via a ftp “-ls” command, and acquires the PDR file information via a ftp “get” command (note: see section 4.2.6 for security aspects). At the PDR Server, an ftp daemon continually listens for incoming ftp requests, acts on each arriving ftp request, and routes each ftp request to the appropriate account, making the directory sub-tree available to ECS with the allowable privileges.

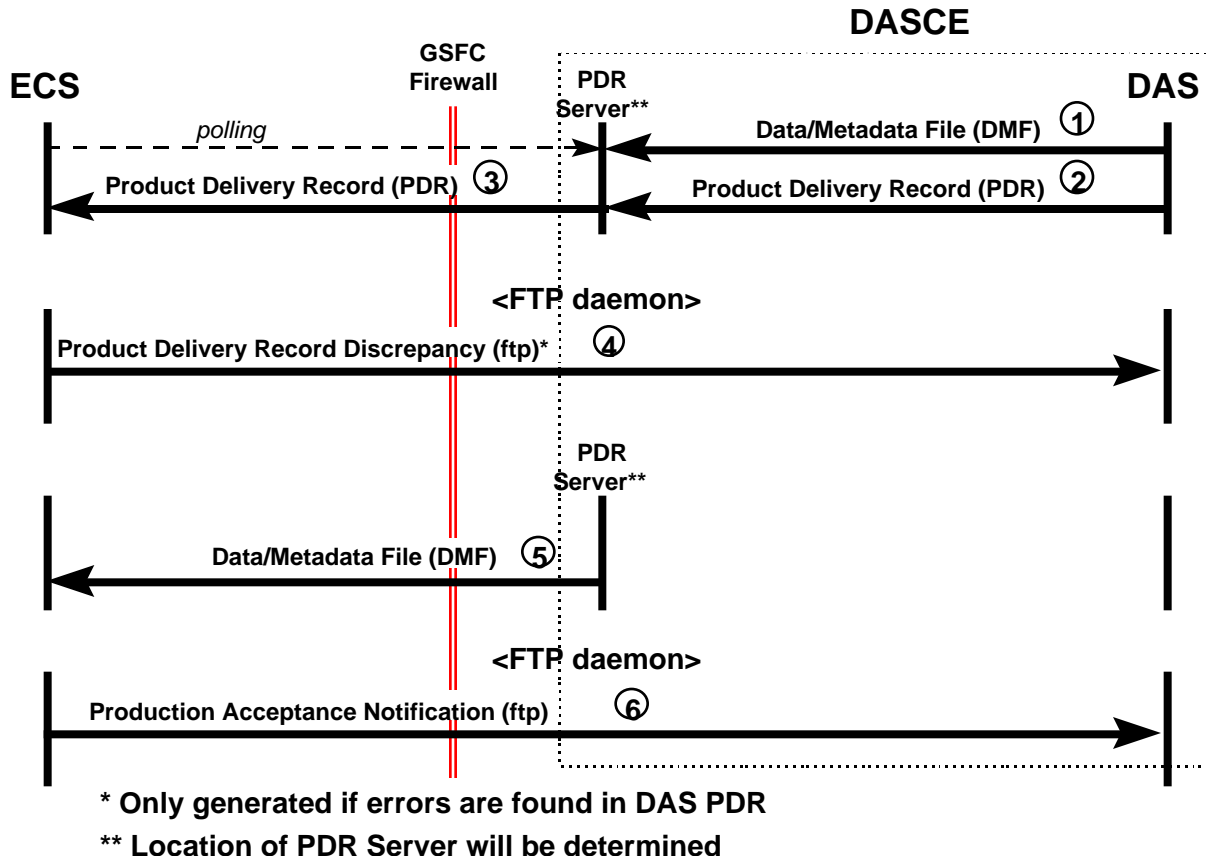
- (4) ECS sends Product Delivery Record Discrepancy (PDRD) to the DAS (via ftp) indicating errors found in PDR -

Once a PDR has been detected/acquired by ECS, the PDR is validated. In the event that the PDR is invalid, ECS automatically returns a Product Delivery Record Discrepancy (PDRD), via ftp, to the supplier system. If the PDR is valid, ECS schedules to pull the DMF and reports using an ftp “get” command; in this case no PDRD is sent. If an error is detected in the PDR, processing is terminated and none of its files are transferred to the ECS server for processing until a corrected PDR is received and successfully processed.

- (5) ECS pulls the DMF from the PDR Server to be ingested. The DMF is then archived.
- (6) ECS sends a Production Acceptance Notification (PAN) to the DAS (via ftp) indicating either success or errors found.

Operator tunable parameters for the transfer of the PDR, PDRD and PAN include the time between ECS Ingest receiving a failure and sending a new PDRD/PAN, and the DAS waits to receive a PDRD (or PAN) before placing another PDR in the directory on the PDR Server. All relevant operator tunable parameters will be documented in the operations procedures for the DAS and ECS as an integral part of the DAAC Operations Manual (DID 611).

The Polling Ingest with PDR transfer mechanism is fully automated. In the context of this transfer mechanism, this section addresses the PDR, PDRD and PAN. In addition, the error conditions, error handling/backup methods, and physical media are discussed herein.



**Figure 4-1: DAS/ECS Data/Metadata File Transfer Mechanism**

#### 4.2.2 Product Delivery Record (PDR)

The purpose of the PDR is to announce the availability of a Data/Metadata File (DMF) for transfer, including file names, file size, location, etc. The PDR is generated and placed in a pre-specified directory on the PDR Server by the system supplying the data (i.e., the DAS) after the data files referenced in the PDR have been placed into their respective directories. Both the server and the directory names are operator configurable parameters. ECS polls the PDR Server, detects/acquires/validates the PDR, and schedules to pull the DMF.

The PDR format is comprised of Parameter-Value Language (PVL) Statements. The required PDR PVL parameters are depicted in Table 4-1. The PDR PVL statements are ASCII strings, having at most 256 characters, in the form: "Parameter = Value." The Value strings shown in Table 4-1 include pre-defined values shown by single quote marks and processor determined values which include ASCII strings, International Standards Organization (ISO) times, and

integers to be filled in with appropriate values by the DAS System processor during PDR creation. An example PDR PVL for a DMF is provided in Figure 4-2. The maximum allowed message length for a PDR is 1 megabyte. PDRs are validated to check that all required fields contain valid values and that the format of the PDR is correct and consistent with the standards. PDRs that adhere to the defined message standards shown in Table 4-1 are accepted and processed. Additional information on PVL valid characters can be found in the document entitled, "Consultative Committee for Space Data Systems (CCSDS), Parameter Value Language Specification (CCSD0006), Blue Book."

It is important to note that a `FILE_GROUP` consists of all files of one `DATA_TYPE` that compose a granule. (A granule is the smallest aggregation of data that can be inventoried within ECS and ordered from ECS.) All files within a `FILE_GROUP` are stored together in the ECS archive.



**Table 4-1. PDR PVL Parameters**

<b>Parameter</b>	<b>Description</b>	<b>Type</b>	<b>Format/ Max Size (Bytes)</b>	<b>Values</b>
ORIGINATING_SYSTEM	Originator of Delivery Record	Variable String	ASCII (20)	DAS Processor Identifier (Note 1)
TOTAL_FILE_COUNT	Total number of files to transfer	Integer	ASCII (4)	1 - 9999
EXPIRATION_TIME (Note 2)	ISO Time for data deletion from originating system. This time is set by the DAS based on available resources.	Fixed String	ASCII (20)	GMT in for the format: yyyy-mm-ddThh:mm:ssZ, where T indicates the start of time information and Z indicates "Zulu" time. (operations tunable amount of time after PDR sent)
OBJECT	Start of file group parameters (repeat for each group of files).	Fixed String	ASCII (10)	'FILE_GROUP'
DATA_TYPE	ECS Data Type	Fixed String	ASCII (8)	See Appendix A (TBD)
NODE_NAME	Name of network node on which the file resides	Variable String	ASCII (64)	e.g., 'calibsrv.nasa.gov'
OBJECT	Start of file parameters (repeat for each file in file group)	Fixed String	ASCII (9)	'FILE_SPEC'
DIRECTORY_ID	File directory name (i.e. path name)	Variable String	ASCII (Note 3)	e.g., /DAS1/CAL1/
FILE_ID	File name	Variable String	ASCII (Note 4)	DAS file name (per DAS Data/Metadata File Definition)
FILE_TYPE	File Data Type	Variable String	ASCII (20)	e.g., 'RAD_CAL_COEF' 'GEO_CAL_COEF'
FILE_SIZE	Length of file in bytes	Unsigned 32-bit Integer	ASCII (10)	< 2 GB
END_OBJECT	End of file parameters (repeat for each file)	Fixed String	ASCII (9)	'FILE_SPEC'
END_OBJECT	End of file group (repeat for each group of files)	Fixed String	ASCII (10)	'FILE_GROUP'

Note 1. Used in PAN & PDRD to identify DAS response.

Note 2. Only used when PDR server is not under ECS control.

Note 3. Size can vary up to 256 bytes total when DIRECTORY\_ID is combined with FILE\_ID.

Note 4. Size can vary up to 256 bytes total when FILE\_ID is combined with DIRECTORY\_ID.

EXAMPLE ONLY	EXAMPLE ONLY
<pre> ORIGINATING_SYSTEM = DAS1234;  /* DAS Processor Identifier */ TOTAL_FILE_COUNT = 2; OBJECT = FILE_GROUP;     DATA_TYPE = DAS_DATA;  /* Allowed values pre-defined by ECS */     NODE_NAME = calibsrv.nasa.gov;     OBJECT = FILE_SPEC;         DIRECTORY_ID = DAS1/CAL1/;         FILE_ID = 7DASCALP.01A;  /* '01' = File #, 'A' = Version */         FILE_TYPE = RAD_CAL_COEF;  /* Allowed values pre-defined by ECS */             FILE_SIZE = 1000000;         END_OBJECT = FILE_SPEC;     OBJECT = FILE_SPEC;         DIRECTORY_ID = DAS1/CAL2/;         FILE_ID = 7DASCALP.02A;         FILE_TYPE = GEO_CAL_COEF;  /* Allowed values pre-defined by ECS */             FILE_SIZE = 1000000;         END_OBJECT = FILE_SPEC;         -----         /* Repeat FILE_SPEC objects for each DAS data file within file group */         ----- END_OBJECT = FILE_GROUP;         -----         /* Repeat FILE_GROUP objects for each different file group */         ----- </pre>	

**Figure 4-2. Example PDR PVL For Data/Metadata File**

**Table 4-2: File Naming Convention For DAS Product Delivery Record**

Field	Description	Format/ Type Max Size (Bytes)	Value
DAS Designation	Designation for DAS	ASCII String (20)	Originating System in PDR
PDR Creation Date	Date when PDR was created	ASCII (14)	yyyymmddhhmmss
Filename extension	Extension for file PDR filename	ASCII String (3)	'PDR'

EXAMPLE ONLY	EXAMPLE ONLY
<p>FILENAME = DAS123.yyyymmddhhmmss.PDR,  where  yyymmddhhmmss = date = 20010719123845,</p>	

**Figure 4-3. Example PDR File Naming Convention**

### 4.2.3 Product Delivery Record Discrepancy (PDRD)

The Product Delivery Record Discrepancy (PDRD) is sent by ECS to the supplier system (i.e., DAS), via ftp, only in the event that the PDR cannot be successfully validated. The PDRD identifies the error/success dispositions for file groups in the PDR resulting from ECS's attempt to validate the PDR. The file naming convention for the PDRD will follow the name of the appropriate PDR except that the PDRD will have an extension of .PDRD. There are two forms of PDRD, including a short form (Table 4-3) and long form (Table 4-4). The short form is used for a PDR when the first error encountered in each file group within the PDR is the same or the first error found applies to each group. The long form is used when one or more file groups in the PDR have invalid parameters; some file groups may be error-free. For each file group, if an error is encountered, ECS halts processing and reports the error which it just encountered for that file group. All remaining conditions in that file group are not validated. ECS processing then continues on with the next file group in the PDR. The dispositions in the Long PDRD will be reported for all file groups in the order listed in the PDR. In the event that a PDRD is returned to DAS, none of the files are transferred to the ECS for processing, and the DAS must correct the errors and resubmit the entire PDR for processing. The PDRD consists of PVL Statements. Short and Long PDRD PVL examples are provided, respectively, in Figure 4-4 and Figure 4-5.

**Table 4-3. Short Product Delivery Record Discrepancy PVL Parameters**

<b>Parameter<sup>2</sup></b>	<b>Description</b>	<b>Type/Format (Length in Bytes)</b>	<b>Value<sup>2</sup></b>
MESSAGE_TYPE	Short Product Delivery Record Discrepancy	Fixed String/ASCII (9)	SHORTPDRD
DISPOSITION	Disposition of Ingest Request <sup>1</sup>	Variable String/ASCII (64)	One of the following: "INVALID FILE COUNT" "ECS INTERNAL ERROR" "DATABASE FAILURES" "INVALID PVL STATEMENT" "MISSING OR INVALID ORIGINATING_SYSTEM PARAMETER" "DATA PROVIDER REQUEST THRESHOLD EXCEEDED" "DATA PROVIDER VOLUME THRESHOLD EXCEEDED" "SYSTEM REQUEST THRESHOLD EXCEEDED" "SYSTEM VOLUME THRESHOLD EXCEEDED"

Note 1. In any given instance, only one disposition value is provided. In cases where multiple errors may exist, the disposition value corresponding to the first error encountered will be provided.

Note 2. Each parameter/value is followed by an EOL mark.

<b>EXAMPLE ONLY</b>	<b>EXAMPLE ONLY</b>
MESSAGE TYPE = SHORTPDRD; DISPOSITION = "DATABASE FAILURES";	

**Figure 4-4. Example Short PDRD PVL**

**Table 4-4. Long Product Delivery Record Discrepancy PVL Parameters**

Parameter <sup>2</sup>	Description	Type/Format (Length in Bytes)	Value <sup>2</sup>
MESSAGE_TYPE	Long Product Delivery Record Discrepancy	Fixed String/ASCII (8)	LONGPDRD
NO_FILE_GRP (to follow)	Number of File Groups in the PDR	Integer/ASCII (4 )	Number of File Groups in the PDR

**For each file group in the PDR**

DATA_TYPE	ECS Data Type	ASCII String ( 20)	DATA_TYPE in PDR
DISPOSITION	Disposition of Ingest Request <sup>1</sup>	Variable String/ASCII (64)	One of the following: "SUCCESSFUL" "INVALID DATA TYPE" * "INVALID DIRECTORY" * "INVALID FILE SIZE" "INVALID FILE ID" * "INVALID NODE NAME" * "INVALID FILE TYPE" *

Note 1. For each file group, only one disposition value may be provided. In cases where multiple errors may exist, the disposition value corresponding to the first error encountered will be provided.

Note 2. Each parameter/value statement is followed by an EOL mark.

\* Null string check only

**EXAMPLE ONLY****EXAMPLE ONLY**

```
MESSAGE_TYPE = LONGPDRD;
NO_FILE_GRP = 3;
DATA_TYPE = DAS_DATA1;
DISPOSITION = "INVALID DATA TYPE";
DATA_TYPE = DAS_DATA2;
DISPOSITION = "INVALID FILE ID";
DATA_TYPE = EDP_DATA3;
DISPOSITION = "SUCCESSFUL";
```

**Figure 4-5. Example Long PDRD PVL****4.2.4 Production Acceptance Notification (PAN)**

After the data have been ingested/archived by ECS, ECS automatically sends a "Production Acceptance Notification" (PAN), via ftp, to the DAS system. The PAN file announces the completion of data transfer and archival, and identifies any errors or problems that have been encountered. The file naming convention for the PAN will follow the name of the appropriate PDR except that the PAN will have an extension of .PAN. There are two forms of the PAN available for use, including a short (Table 4-5) and a long (Table 4-6) form. The short form of

the PAN is sent to acknowledge that all files have been successfully transferred, or to report errors which are not specific to individual files but which have precluded processing of any and all files (e.g., ftp failure). If all files in a request do not have the same disposition, a long form of this message is employed. For each file in a file group, if an error is encountered, ECS halts processing and reports the error which it just encountered for that file. All remaining conditions in that file are not validated. ECS processing then continues on with the next file in the file group. If there are no more files to process in the file group, ECS processing then continues on with the next file group in the PDR. The PAN consists of PVL Statements. Short and Long PAN PVL examples are provided, respectively, in Figure 4-6 and Figure 4-7.

**Table 4-5. Short Production Acceptance Notification PVL Parameters**

Parameter <sup>2</sup>	Description	Type/Format (Length in Bytes)	Value <sup>2</sup>
MESSAGE_TYPE	Short Production Acceptance Notification Definition	Fixed String/ASCII (8)	SHORTPAN
DISPOSITION	Disposition of Ingest Request <sup>1</sup>	Variable String/ASCII (64)	One of the following: "SUCCESSFUL" "NETWORK FAILURE" "UNABLE TO ESTABLISH FTP/KFTP CONNECTION" "ALL FILE GROUPS/FILES NOT FOUND" "FTP/KFTP FAILURE" "POST-TRANSFER FILE SIZE CHECK FAILURE" "FTP/KFTP COMMAND FAILURE" "DUPLICATE FILE NAME IN GRANULE" "METADATA PREPROCESSING ERROR" "RESOURCE ALLOCATION FAILURE" "ECS INTERNAL ERROR" "DATA BASE ACCESS ERROR" "INCORRECT NUMBER OF METADATA FILES" "INCORRECT NUMBER OF SCIENCE FILES" "INCORRECT NUMBER OF FILES" "DATA CONVERSION FAILURE" "REQUEST CANCELLED" "UNKNOWN DATA TYPE" "INVALID OR MISSING FILE TYPE" "FILE I/O ERROR" "DATA ARCHIVE ERROR"
TIME_STAMP	ISO Time when Destination System transferred the last part of data	ASCII (20)	GMT in the format: yyyy-mm-ddThh:mm:ssZ, where T indicates the start of time information and Z indicates "Zulu" time (Null if disposition is not "SUCCESSFUL")

Note 1. In any given instance, only one disposition value may be provided. In cases where multiple errors have occurred, the disposition value corresponding to the first error encountered will be provided.

Note 2. Each parameter/value statement is followed by an EOL mark.

**EXAMPLE ONLY**

**EXAMPLE ONLY**

MESSAGE\_TYPE = SHORTPAN;  
DISPOSITION = "POST-TRANSFER FILE SIZE CHECK FAILURE";  
TIME\_STAMP = 1996-06-23T09:46:35Z;

**Figure 4-6. Example Short PAN PVL**

**Table 4-6. Long Production Acceptance Notification PVL Parameters**

<b>Parameter<sup>2</sup></b>	<b>Description</b>	<b>Type/Format (Length in Bytes)</b>	<b>Value<sup>2</sup></b>
MESSAGE_TYPE	Long Production Acceptance Notification	Fixed String/ASCII (7)	LONGPAN
NO_OF_FILES	Number of Files in PDR	ASCII (4)	TOTAL_FILE_COUNT parameter in PDR

**For each File in the PDR**

FILE_DIRECTORY	ASCII string specifying file directory location	ASCII (<256) Equivalent to PDR length	DIRECTORY_ID parameter in PDR
FILE_NAME	File names on system creating PDR	ASCII (<256) Equivalent to PDR length	FILE_ID parameter in PDR
DISPOSITION	Disposition of Ingest Request <sup>1</sup>	Variable String/ASCII (64)	One of the following: "SUCCESSFUL" "NETWORK FAILURE" "UNABLE TO ESTABLISH FTP/KFTP CONNECTION" "ALL FILE GROUPS/FILES NOT FOUND" "FTP/KFTP FAILURE" "POST-TRANSFER FILE SIZE CHECK FAILURE" "FTP/KFTP COMMAND FAILURE" "DUPLICATE FILE NAME IN GRANULE" "METADATA PREPROCESSING ERROR" "RESOURCE ALLOCATION FAILURE" "ECS INTERNAL ERROR" "DATA BASE ACCESS ERROR" "INCORRECT NUMBER OF METADATA FILES" "INCORRECT NUMBER OF SCIENCE FILES" "INCORRECT NUMBER OF FILES" "DATA CONVERSION FAILURE" "REQUEST CANCELLED" "UNKNOWN DATA TYPE" "INVALID OR MISSING FILE TYPE" "FILE I/O ERROR" "DATA ARCHIVE ERROR"
TIME_STAMP	ISO Time when Destination System transferred the last part of the data	ASCII (20)	GMT in the format: yyyy-mm-ddThh:mm:ssZ, where T indicates the start of time information and Z indicates "Zulu" time. (Null if disposition is not "SUCCESSFUL")

Note 1. In any given instance, only one disposition value may be provided. In cases where multiple errors have occurred, the disposition value corresponding to the first error encountered will be provided.

Note 2. Each parameter/value statement is followed by an EOL mark.

**EXAMPLE ONLY****EXAMPLE ONLY**

```

MESSAGE_TYPE = LONGPAN;
NO_OF_FILES = 3;
FILE_DIRECTORY = DAS1/CAL1;
FILE_NAME = 7DASCALP.01A;
DISPOSITION = "UNABLE TO ESTABLISH FTP CONNECTION";
TIME_STAMP = 1996-04-28T23:49:59Z;
FILE_DIRECTORY = DAS1/CAL2;
FILE_NAME = 7DASCALP.02A;
DISPOSITION = "ECS INTERNAL ERROR";
TIME_STAMP = 1996-04-28T23:59:59Z;
FILE_DIRECTORY = DAS1/CAL2;
FILE_NAME = 7DASCALP.03A;
DISPOSITION = "SUCCESSFUL";
TIME_STAMP = 1996-04-28T23:59:59Z;

```

***Figure 4-7. Example Long PAN PVL***

#### **4.2.5 DAS-ECS Electronic Data Exchange Error Handling/Back-up Methods**

During the course of data exchange via ftp, the following typical error conditions may arise:

- Failure to establish TCP/IP connection
- Erroneous ftp command
- File not found (listed in PDR, but not found on disk)
- File not readable due to permissions

Should a problem develop during an FTP file transfer due to any of the above error conditions, an operator-tunable number of attempts are made to get/push the data. In the event that problems are related to failure of network communications, ECS will deliver data once the network connection has been re-established.

#### **4.2.6 DAS-ECS Electronic Data Exchange Security**

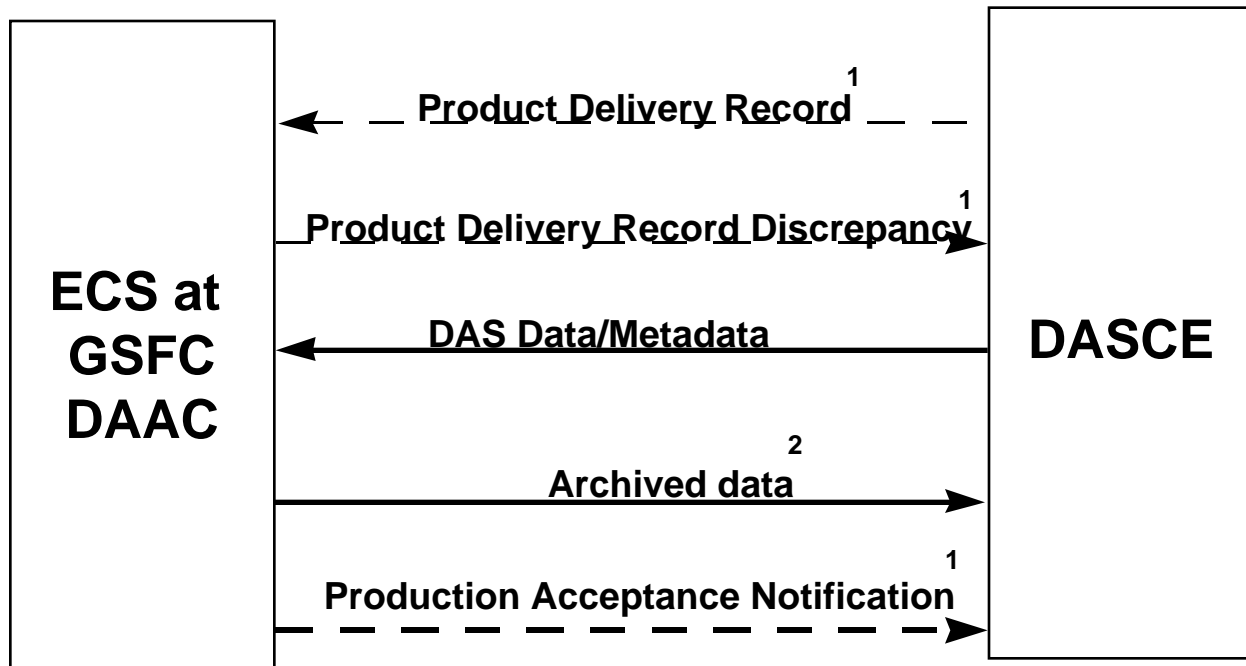
The ESDIS Security Policy in regards to file transfer is summarized as: Writing to the ECS archive requires a strongly authenticated, ftp or DCE, client. Any applications in which ECS is polling the DASCE, standard ftp login procedures including the use of a password for the



purposes of security is used. User IDs and passwords are needed for ftp connections and are maintained by ECS. It is recommended that User IDs and passwords be changed, via the DAAC administrator, periodically (on the order of every six months) or whenever a system compromise is suspected.

## 5. Data Flow Descriptions

Figure 5-1 identifies the data flows between ECS and DAS. These flows are accomplished by electronic data exchanges. Descriptions of the data exchange framework supporting these flows are found in Section 4 of this ICD. Specific characteristics of each direct data flow shown in Figure 5-1 are described in Sections 5.1 through 5.2, including interface methods, data formats, and error handling conditions.



Note 1: Defined in Section 4

Note 2: ECS Release B.1 functionality

**Figure 5-1. Data Flows Between ECS and DAS**

### 5.1 DAS Product Data Transfer Profile

The DAS Product Data interface provides the means for the DAS to transfer DAS processed data and metadata in HDF-EOS format to ECS. DAS data files are transferred electronically from DASCE to ECS through the ECS automated network ingest process (Section 4.2.1). This process requires use of control messages and file transfer protocol (ftp). The data files are pulled by ECS from specified DASCE staging areas. ECS is sized to receive up to 26.6 GB of data per day from DAS (during Reanalysis Mode (Release B.1)). DAS data files are provided to ECS in

HDF-EOS format. The basis of the HDF-EOS format is a file organization which can support a variety of data models for accessing scientific and related data. HDF-EOS is fully compatible with the Hierarchical Data Format (HDF); HDF-EOS assigns purposes to the HDF models for consistency of use. HDF data types are described in the HDF-EOS Primer for Version 1 EOSDIS (White Paper), Document # 175-WP-001-001.

In ECS Release B.1, distribution of archived data to the DASCE DRP will be handled via a machine to machine interface **TBD**.

## 5.2 DAS Standard Product Data

The DAS product data consists of HDF-EOS formatted files as delivered to the ECS. The daily data delivery consists of data in Operations, Reanalysis, and Scientific Development modes in a binary format. The volume of DAS data provided to ECS on a daily basis is approximately 5.8GB Operations mode, 26.6GB Reanalysis mode, and 5.0 GB in Scientific Development mode.

The file naming convention for the DAS input file to ECS is **TBD**:

## Appendix A. ECS Data Type Identifier for DAS Products

Tables A-1 through A-5 in this Appendix show the product groups and the rate of output data to be passed from the DASCE to ECS at the GSFC DAAC. The data rate is based on 32 bit data.

The input data rate from ECS to DASCE at the DAACs will be determined by future discussions and working groups.

The yearly data volume depends upon how often the DAO generates Reanalysis products.

***Table A-1. First Look Analysis Major Product Groups***

AHWGP Name	Data Rate (MBs)/day*		File Description	ESDT
	2.0 x 2.5	1.0 x 1.0 (1999)		
DAS_FLK_ANALYSIS (HDF-EOS format)	838.0	4190.0	DAS First Look Analysis Product produced for AM-1 Instrument Teams to use in their retrievals	<b>TBD</b>
DAS_FLK_10DAY_FORECAST (HDF-EOS format)	3894	19470.0	10 Day Forecast Product to validate DAS products	<b>TBD</b>
DAS_FLK_10DAY_Forecast_Archive (HDF-EOS format)	338	1690.0	10 Day Forecast Product to validate DAS products (Certain products to be archived over time)	<b>TBD</b>
DAS_TRMM_AM1_ANALYSIS (HDF-EOS format)	100	500.0	Analysis products for TRMM and AM-1 Instruments to do their retrievals	<b>TBD</b>
DAS_FLK_RESTART_FILE	149.4	747	Archived to redo First Look Analysis	<b>TBD</b>
DAS_OBS_FILE_FSTLK	50.0		Aggregate product of all data used in this analysis	<b>TBD</b>

\* 1 day of data assimilation per 1 calendar day.

**Table A-2. Final Platform Analysis Major Product Groups**

AHWGP Name	Data Rate (MBs)/day*		File Description	ESDT
	2.0 x 2.5	1.0 x 1.0 (1999)		
DAS_FNLPLTFM_PRODUCT (HDF-EOS format)	588.0	2940.0	Final Platform Analysis Product (using AM-1 and other satellite data)	<b>TBD</b>
DAS_FNLPLTFM_RESTART_FILE	149.4	747.0	Archived to redo Final Platform Analysis	<b>TBD</b>
DAS_OBS_FILE_FNLPLTFM	5.0		Aggregate product of all data used in this analysis	<b>TBD</b>

\* 1 day of data assimilation per 1 calendar day.

**Table A-3. Pocket Analysis Major Product Groups**

AHWGP Name	Data Rate (MBs)/day*		File Description	ESDT
	2.0 x 2.5	1.0 x 1.0 (1999)		
DAS_POCKET_ANALYSIS_PRODUCT (HDF-EOS format)	25140.0	125700	Pocket Analysis Product (Using AM-1 and other Satellite Data)	<b>TBD</b>
DAS_POCKET_RESTART_FILE	149.4	747.0	Archived to redo any of the Pocket Analysis. Only saved once per 30 days of assimilation	<b>TBD</b>
DAS_OBS_FILE_PCKT_ANALYS	1500.0		Aggregate product of all data used in this analysis	<b>TBD</b>

\* 30 days of data assimilation per 1 calendar day. Assume only 1 of 3 Reanalysis Modes running at a time.

**Table A-4. Long Term Re-Analysis Major Product Groups**

AHWGP Name	Data Rate (MBs)/day*		File Description	ESDT
	2.0 x 2.5	1.0 x 1.0 (1999)		
DAS_REANALYSIS_PRODUCT (HDF-EOS format)	25140.0	125700	Long Term Reanalysis Product of the DAO (Using AM-1 and other satellite data)	<b>TBD</b>
DAS_REANALYSIS_RESTART_FILE	149.4	747.0	Archived to redo a Reanalysis for up to 20 years. Only saved once per 30 days of assimilation	<b>TBD</b>
DAS_OBS_FILE_REANALYSIS	1500.0		Aggregate product of all data used in this analysis	<b>TBD</b>

\* 30 days of data assimilation per 1 calendar day. Assume only 1 of 3 Reanalysis Modes running at a time.

**Table A-5. Off-Line Re-Analysis Major Product Groups  
(2.0 Degrees latitude x 2.5 degrees longitude horizontal resolution)**

AHWGP Name	Data Rate (MBs)/day		File Description	ESDT
	2.0 x 2.5	1.0 x 1.0 (1999)		
DAS_OFFLINE_REANALYSIS_PRODUCT (HDF-EOS format)	2514.0	12570.0	DAO's Off-line Reanalysis Product (Using AM-1 and other Satellite Data)	<b>TBD</b>
DAS_OFFLINE_RESTART_FILE	149.4	747.0	Archived to redo any of the Off-line Reanalysis. Only saved once per 30 days of assimilation	<b>TBD</b>
DAS_OBS_FILE_OFNLN_REANALYSIS	1500.0		Aggregate product of all data used in this analysis	<b>TBD</b>

\* 30 days of data assimilation per 1 calendar day. Assume only 1 of 3 Reanalysis Modes running at a time.

*Note: The naming convention of the products listed in the appendix were used for the Ad Hoc Working Group on Production (AHWGP) effort and may not be the actual product names used by DAO and/or ECS when the products are actually generated.*

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## Appendix B. Work-off Plan for ECS-DAS ICD

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**Table B-1. Work-off Plan for ECS-DAS ICD**

ICD Issue #	ICD Para. #	Issue Priority	ICD Issue Type & Description	Work-off Plan Task(s)	Projected Resolution Date	Risk Assessment**
1	5.2	B	The file naming convention for the DAS input file to ECS	ECS and DAO will determine	Oct 97	Needed to complete data format definition (ECS B.0 Release)
2	Appendix A, Table 4-1	B	ECS Data Type Identifier for DAS products.	ECS and DAO will determine	Oct 97	Needed to identify data type(s) for DAS products (ECS B.0 Release)
3	3.0, Table 3.1, 4.2, 5.1	A	ECS B.1/DAS machine-to-machine interface	ECS and DAO will determine	Nov 97	Needed to complete ECS B.1 design (ECS B.1 Release)

\* Issue Priority Categories:

A = Design impact; e.g., an unresolved interface.

B = Minimal design impact; e.g., content or format of a specific field unresolved.

C = No design impact - administrative detail; e.g., reference document number is not available.

\*\* Risk Assessment Definition: 2 - Risk if issue is not resolved by projected resolution date.



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## Abbreviations and Acronyms

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ATM	Asynchronous Transfer Mode
B.0	Release B.0
B.1	Release B.1
CBI	Computer Based Interface
CCB	Configuration Control Board
CCR	Configuration Change Request
CDR	Critical Design Review
CDRL	Contract Data Requirements List
CNE	Center Network Environment
COARDS	Cooperative Ocean/Atmosphere Research Data Service
COTS	Commercial Off-the-Shelf
CSMS	Communications and Systems Management Segment
CSS	Communication Subsystem
DAAC	Distributed Active Archive Center
DAO	Data Assimilation Office
DAS	Data Assimilation System
DASCE	Data Assimilation System Computing Environment
DCE	Distributed Computing Environment
DCN	Document Change Notice
DFCB	Data Format Control Book
DID	Data Item Description
DMF	Data/Metadata Files
DRP	Data Reduction Platform
ECS	EOSDIS Core System
EOS	Earth Observing System
EOSDIS	EOS Data and Information System

ESDIS	Earth Science Data and Information System
ESDT	Earth Science Data Types
EDOS	EOS Data and Operations System
EOC	EOS Operations Center
FLID	First Look Input Data
ftp	File Transfer Protocol
GB	Gigabyte
GSFC	Goddard Space Flight Center
HDF	Hierarchical Data Format
HDF-EOS	Hierarchical Data Format - Earth Observing System
I/F	Interface
I&T	Integration and Test
ICD	Interface Control Document
IP	Internet Protocol
IRD	Interface Requirements Document
ISO	International Standards Organization
LAN	Local Area Network
MB	Megabyte, also Mbyte
Mbps	Megabits per second
MOU	Memoranda of Understanding
NA	Not Applicable
NASA	National Aeronautics and Space Administration
Nascom	NASA Communications
NOAA	National Oceanic and Atmospheric Administration
NREN	National Research and Education Network
NSI	NASA Science Internet
ODL	Object Description Language
OSI	Open System Interconnect
PCD	Payload Correction Data

PAN	Production Acceptance Notification
PDR	Product Delivery Record
PDRD	Product Delivery Record Discrepancy
PVL	Parameter Value Language
QA	Quality Assurance
QC	Quality Control
SCF	Science Computing Facility
SDPF	Sensor Data Processing Facility
SDPS	Science Data Processing Segment
SDS	Scientific Data Sets
SDSRV	Science Data Server
TBD	To Be Determined
TBR	To Be Resolved
TBS	To Be Supplied
TCP	Transmission Control Protocol
TRMM	Tropical Rainfall Measuring Mission

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